IN THE CLAIMS:

1. (Currently Amended) A magnetic resonance imaging method wherein spatially encoded undersampled magnetic resonance signals are acquired by one or more receiver antennae and one or more images are reconstructed from the spatially encoded undersampled magnetic resonance signals as a result of optimizing the spatial response function (SRF), which is defined by the spatial signal response from the object to be imaged, individually for each pixel of an image.

2. (Original) A magnetic resonance imaging method according to claim 1, wherein the spatial encoding is provided by the spatial sensitivity profiles of the receiver antenna system, by gradient encoding, by RF encoding, by any spatial variation of magnetization or precession frequency, such as from inhomogeneity of the main magnetic field, or by any combination of the above encoding mechanisms.

3. (Currently Amended) A magnetic resonance imaging method according to claim 1 [[or 2]], wherein the spatial response function is optimized individually for each pixel by minimizing a cost function, which determines the deviation of the spatial response function from a target spatial response function specified individually for each pixel.

4. (Original) A magnetic resonance imaging method according to claim 3, wherein the cost function is determined by a norm of the deviation of the spatial response function after an optional linear mapping, wherein the specific choices of linear mapping and norm can be chosen individually for each pixel.

5. (Original) A magnetic resonance imaging method according to claim 4, wherein the norm is a p-norm.

6. (Currently Amended) A magnetic resonance imaging method according claim 4 [[or 5]], wherein an iterative algorithm is applied for optimization of the cost function.

7. (Currently Amended) A magnetic resonance imaging method according to claim 1 ~~one of claims 1 to 6~~, wherein the shape of the spatial response function is optimized jointly with the noise level in the final image, and wherein

optionally the cost function for each pixel is modified to additionally include the noise statistics of the pixel.

8. (Original) A magnetic resonance imaging method according to claim 7, wherein the cost function is a sum or a sum of squares of one term measuring SRF deviation, and one term measuring noise statistics, with or without weighting in the summation.

9. (Original) A magnetic resonance imaging method according to claim 7, wherein the estimate of the noise level is based on the noise covariance of the input data.

10. (Currently Amended) A magnetic resonance imaging method according to claim 1~~claims 1 to 9~~, wherein the spatial response functions are discretized with a sufficiently high resolution to capture all significant features of target and actual SRFs, the latter of which is determined by the resolution of the acquired data.

11. (Currently Amended) A magnetic resonance imaging method according to claim 1 ~~one of claims 1 to 10~~, wherein the optimization of the spatial response function is weighted within the object to be imaged.

12. (Currently Amended) A magnetic resonance imaging method according to claim 1 ~~one of claims 1 to 11~~, wherein target response functions that have a distinctive peak at their respective voxel centers, and arranged in any pattern, are applied for optimization of the spatial response function.

13. (Currently Amended) A magnetic resonance imaging method as in claim 1 ~~one of claims 1 to 12~~, where any of the choices for the linear transform or norm used in measuring SRF deviation, the target SRFs, the pattern and density of the discretization is based on an estimate of the signal distribution or covariance in the object or in reference image data, or based on anatomical or physiological side information.

14. (Currently Amended) A magnetic resonance imaging system comprising:
- a static main magnet having a main magnetic field,
~~- at least one receiver antenna,~~
- means for applying a read gradient and other gradients,
- means for measuring MR signals along a predetermined trajectory containing

a plurality of lines in *k*-space

- a receiver antenna system having at least one receiver antenna for acquiring undersampled MR signals, each receiver antenna position having a spatial sensitivity profile,
- means for reconstruction the image from the undersampled magnetic resonance signals, and
- means for optimization of a cost function, which determines the deviation of the spatial response function from a target spatial response function specified individually for each pixel of an image and/or its corresponding noise statistics.

15. (Original) A computer program product stored on a computer usable medium for forming an image by means of a magnetic resonance method comprising a computer readable program means for causing the computer to control the execution of:

- applying a read and other gradients,
- measuring MR signals along a predetermined trajectory containing a plurality of lines in *k*-space
- acquiring undersampled MR signals from a receiver antenna system, each receiver antenna position having a spatial sensitivity profile,
- reconstructing the image from the undersampled magnetic resonance signals, and
- optimization of a cost function, which determines the deviation of the spatial response function from a target spatial response function specified individually for each pixel of an image and/or its corresponding noise statistics.